

Appl. No. 10/801,828
Amdt. Dated Aug. 4, 2005
Reply to Office Action of May 4, 2005

REMARKS

In response to this office action, applicant has canceled claim 3, and added the limitation of claim 3 into claims 1, 11 and 21. Claim 4 has been amended to depend from claim 1, and also in respect of a minor informality.

Claim Rejections under 35 U.S.C. 102

Claims 1-2, 6, 8 and 21 are rejected under 35 U.S.C. 102(b) as being anticipated by Denton et al. ("Fully Depleted Dual-Gated Thin-Film SOIP-MOSFET's Fabricated in SOI islands with an Isolated Buried Polysilicon Backgate," IEEE Electron Device Letters, Vol. 17, No. 11, November 1996, pgs. 509-511).

Examiner states that "Denton (FIG. 1) discloses a thin film transistor, comprising: a substrate; a gate electrode (polysilicon bottom gate) disposed in the substrate..."

In response to the rejection, applicant has canceled claim 3, and has amended claims 1 and 21. Applicant traverses the rejection as follows:

Amended claim 1 now recites in pertinent part "a thin film transistor, comprising: a substrate; a gate electrode disposed in the substrate, the gate electrode being made of metallic material."

Firstly, the thin film transistor disclosed by Denton comprises a bottom gate disposed in a substrate and made of polysilicon, whereas the thin film transistor disclosed in amended claim 1 comprises a gate electrode disposed in a substrate and made of metallic material.

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Secondly, the thin film transistor disclosed by Denton further comprises a top gate;. That is, the thin film transistor disclosed by Denton is a dual-gated thin film transistor, whereas the thin film transistor of amended claim 1 is a single-gated thin film transistor. These differences indicate that Denton does not teach a thin film transistor comprising all the limitations recited in amended claim 1.

Further, applicant submits that claim 1 is patentable over Denton under 35 U.S.C. 103. There is nothing in the cited reference that teaches or suggests to one of ordinary skilled in the art that he might or should provide the thin film transistor of amended claim 1. Moreover, the thin film transistor of amended claim 1 produces new and unexpected results. That is, the gate electrode made of metallic material is deposited in the substrate, and thus the thickness of the gate electrode can be changed by changing the depth of the substrate etched. As a result, it is easy to increase the thickness of the gate electrode to reduce its impedance, so that the thin film transistor of amended claim 1 can efficiently reduce an RC (resistance-capacitance) delay of a scanning signal.

Accordingly, amended claim 1 is submitted to be patentable over Denton. Reconsideration and withdrawal of the rejection and allowance of amended claim 1 are respectfully requested.

Claims 2, 6 and 8 depend directly from independent amended claim 1, and therefore should also be allowable.

For similar reasons to those asserted above in relation to amended claim 1, it is submitted that Denton does not disclose, teach or suggest all the limitations of the thin film transistor of the display device recited in

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amended claim 21.

Accordingly, amended claim 21 is submitted to be patentable over Denton under both 35 U.S.C. 102(b) and 35 U.S.C. 103. Reconsideration and withdrawal of the rejection and allowance of amended claim 21 are respectfully requested.

Claims 1-2 and 6 are rejected under 35 U.S.C. 102(b) as being anticipated by Maeda (U.S. Pat. 6,423,578).

Examiner states that "Maeda (FIG. 9) discloses a thin film transistor comprising: a substrate 50a, a gate electrode 41 disposed in the substrate 50a..."

Amended claim 1 now recites in pertinent part a thin film transistor, comprising: a substrate; a gate electrode made of metallic material disposed in the substrate; and a gate insulation layer disposed on the substrate and the gate electrode.

Applicant now traverses the rejection insofar as it applies to amended claim 1, as follows:

Maeda (FIG. 9) discloses that a thin film transistor comprises a first support substrate 10, a lower gate electrode 41 is positioned on the side of the first support substrate 10, [and] an insulator 50a (column 4, lines 21-23). However, the thin film transistor of amended claim 1 comprises a gate electrode made of metallic material disposed in the substrate. These differences indicate that Maeda does not teach a thin film transistor comprising all the limitations recited in amended claim 1.

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Further, applicant submits that claim 1 is patentable over Maeda under 35 U.S.C. 103. There is nothing in the cited reference that teaches or suggests to one of ordinary skill in the art that they might or should provide the thin film transistor of amended claim 1. Moreover, the thin film transistor of amended claim 1 produces new and unexpected results. That is, the gate electrode made of metallic material is deposited in the substrate, and thus the thickness of the gate electrode can be changed by changing the depth of the substrate etched. As a result, it is easy to increase the thickness of the gate electrode to reduce its impedance, so that the thin film transistor of amended claim 1 can efficiently reduce an RC delay of a scanning signal.

Accordingly, amended claim 1 is submitted to be patentable over Maeda. Reconsideration and withdrawal of the rejection and allowance of amended claim 1 are respectfully requested.

Claims 2 and 6 depend directly from independent amended claim 1, and therefore should also be allowable.

Claim Rejections under 35 U.S.C. 103

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Maeda (U.S. Pat. 6,423,578).

As detailed above, applicant submits that amended claim 1 is patentable over Maeda under 35 U.S.C. 103. Accordingly, because claim 7 depends directly from claim 1, claim 7 is submitted to be patentable over Maeda. Reconsideration and withdrawal of the rejection

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and allowance of claim 7 are respectfully requested.

Claims 3-5 and 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Denton et al in view of Hiramatsu (U.S. Pat. 5,311,040).

Examiner states Denton does not disclose that the gate electrode is made of metallic material comprising Cu, Al, Ti, Mo, Cr, Ta or Nd. Examiner further states Hiramatsu discloses (FIG. 1) a gate electrode 2 that is made of Ta or MoTa (column 3, lines 25-26) in order to increase conductivity of the semiconductor gate electrode.

In response to the rejection, applicant has canceled claim 3, and has amended claim 4. The rejection of claim 3 is believed to apply to claim 1 as amended, and on this basis applicant now traverses as follows:

Denton discloses that the bottom gate is made of polysilicon, which provides a complete and fully functional thin film transistor. Denton does not teach that the bottom gate may be made of other materials such as metallic material. Therefore, there is no motivation for one of ordinary skill in the art to modify Denton by, say, adding the teachings of Hiramatsu thereto. Applicant respectfully traverses Examiner's reasoning in the Office action regarding the thin film transistor disclosed by Denton being combined with Hiramatsu.

If further argument is required, as detailed above, amended claim 1 is submitted to be patentable over Denton under s.103. Hiramatsu does not provide any additional teaching to the teachings of Denton which might lead one of ordinary skill in the art to provide the thin film transistor of claim 1.

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Accordingly, amended claim 1 is submitted to be patentable over Denton et al. in view of Hiramatsu. Reconsideration and withdrawal of the rejection and allowance of amended claim 1 are respectfully requested.

Claims 4-5 and 9-10 depend from independent amended claim 1, and therefore should also be allowable.

Claims 11-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Denton et al. in view of Honda (U.S. Pat. 6,639,246).

Examiner states that Denton (FIG. 1) discloses, inter alia, a thin film transistor, comprising: a substrate; and a gate electrode (polysilicon bottom gate) disposed in the substrate..." Examiner further states that "Honda (FIG. 9) discloses a display device including a plurality of thin film transistors."

In response to the rejection, applicant has amended claim 11. Applicant now traverses the rejection as follows:

Amended claim 11 now recites in pertinent part a display device including a plurality of thin film transistors, each of the thin film transistors comprising a substrate, and a gate electrode disposed in the substrate, the gate electrode being made of metallic material."

Firstly, the thin film transistor disclosed by Denton comprises a bottom gate disposed in a substrate and made of polysilicon, whereas the thin film transistor of amended claim 11 comprises a gate electrode

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disposed in a substrate and made of metallic material. Secondly, the thin film transistor disclosed by Denton further comprises a top gate. That is, the thin film transistor disclosed by Denton is a dual-gated thin film transistor, whereas the thin film transistor of amended claim 11 is a single-gated thin film transistor. These differences indicate that Denton does not teach a thin film transistor comprising all the limitations recited in amended claim 11.

Further, applicant submits that claim 11 is patentable over Denton under 35 U.S.C. 103. There is nothing in the cited reference that teaches or suggests to one of ordinary skill in the art that they might or should provide the thin film transistor of amended claim 11. Moreover, the thin film transistor of amended claim 11 produces new and unexpected results. That is, **the gate electrode made of metallic material is deposited in the substrate,** and thus the thickness of the gate electrode can be changed by changing the depth of the substrate etched. As a result, it is easy to increase the thickness of the gate electrode to reduce its impedance, so that the display of amended claim 11 can efficiently reduce an RC delay of a scanning signal.

Honda does not provide any additional teaching to the teachings of Denton which might lead one of ordinary skill in the art to provide the thin film transistor of claim 11. That is, any combination of Denton with Honda does not teach or suggest the present invention with its unique advantages.

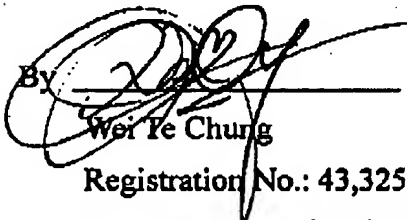
Accordingly, amended claim 11 is submitted to be unobvious and patentable over Denton in view of Honda. Reconsideration and withdrawal of the rejection and allowance of amended claim 11 are

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respectfully requested.

Claim 12 depends directly from independent amended claim 11, and therefore should also be allowable.

In view of the foregoing, the present application as claimed in the pending claims is considered to be in a condition for allowance, and an action to such effect is earnestly solicited.

Respectfully submitted,
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